

CHROMATOTEC
April 2009

AirToxic Analyser

Pneumatic Scheme

- Flow
 - Sampling
 - Calibration
 - Zero air
 - for column,
 - for permeation oven,
 - for lamp cleaning,
 - for valve
- Valve
 - 2 positions depending of valve position in 3 steps:
 - position 1 : sampling and acquisition,
 - position 2 : Thermodesorption and injection in few minutes
 - position 1 ; separation in column with carrier gaz , acquisition

Memo of Running Parameters to be supervised and standard levels :

	Units	AirToxic
PID temperature	(°C)	150
Temperature program (column oven)	(°C)	(15') 43→45→165→43 (30') 40→42→180→40
Trap thermodesorption temperature	(°C)	380
Permeation oven temperature	(°C)	If option 40 or 45
Trap temperature	(°C)	Ambiant temperature
Critical Orifice(50 µm) Flow	(ml/mn)	10 to 20
Carrier gaz (Air/N2) flow	(ml/mn)	3 to 4
Permeation tube dilution flow	(ml/mn)	If option 50 (in continuous) 250 (during calib method)
Analysis Cycle time	5 compounds	15 mn (acquisition 340 sec) 30 mn (acquisition 420 sec) Measure in 2 cycle
Trapping time (method one cycle)		Ambiant 12 mn Calib with tube : 6 mn

		Cylinder (100 ppb) : 4 mn Zero air : 6 mn
Thermodesorption time	(mn)	1
Trap resistance and voltage value :		Resistance : $4\Omega \pm 0.2$ Voltage: 150 to 170 mV
Lamp current	(A)	200 μ A
Head column pressure	hPa	1150 to 1400 A little more high for 30' cycle) (reference is Benzene RT)
DeltaP (Patm – Critical P)		Manual restriction 15 to 25 hPa (alarm min : 10, max : no)
Zero air inlet pressure		3 bars

(*) Remark :

 Flow

Analytical parameters and calculation principles

➤ **Retention Time (RT) time when compounds go out from column**

Written in window form into substance table : +/- 4 secondes from time of the reference RT

Is used for identification by Vistachrom software

Directly link to head column pressure

May change in function of climatic conditions : almost Temperature , but also humidity and head pressure column variations.

Can be rectified in substance table if needed

Reidentification is possible by Peak viewer after substance table modification if not identified

Typical values

	15' cycle Retention Time (secondes)	30' cycle Retention Time (secondes)
Benzene	51-59	130-138
Toluene	160-168	242-250
Ethylbenzene	263-271	343-351
m&p-Xylene	272-280	352-360
o- Xylene	296-304	376-384

➤ **Response Factor (RF) specific correlation coefficient of each compound**

Corrective coefficient that enters in calculation of the compound concentration in function of its answer to the PID compared to Benzene.

Predetermined by Chromatotec thanks to different standard cylinders and cross measurements between analysers

Written in substance table and must not be modified.

Benzene	1
Toluene	1.18
Etylbenzene	1.45
m&p Xylene	1.11
o-Xylene	1.4

➤ **Base Sensitivity : BS = au/ ng**

au : area unit (signal unit) of benzene (C₆H₆) standard

ng : mass of the compound injected = known concentration x trapping time x critical orifice flow (adjusted with critical pressure value measured and critical orifice coefficient)

Critical orifice coefficient written in Vistachrom configuration after preset is “flow / critical pressure”

BS is drifting due to lamp ageing . The autocalibration option permits to rectify this drift. The typical value at beginning is between 15 000 and 40 000 ampli² in function of analysers

➤ **Calculation of compounds concentration.**

Conc = [peak au / (BS x trapped volume)] x RF that means to do : **ng / volume**

Example (Takachiho Cylinder): Benzene = (86480 / 4808 x 55 ml) x 1 = 0.326 mg/m³ (or ng/ml) = 326 µg/m³ = 100.3 ppb at 20°C and 1013 hPa (326 x 24.04)/78.11

Remark : we can pass from µg/m³ to ppb by peak viewer reprocess

➤ **Amplifications**

3 levels of amplification, this is situated in electrometer, the electrometer measures current between electrodes, this current is very low and must be amplified (device including parallel circuits with different resistances).

There is a multiplication factor by 10 between each amplification

For ambient air application, amplification 3 (high) is used; range : 0 – 50 ppb

For higher concentrations, we are obliged to pass in amplification 2 (middle)

If not there is saturation of the signal: level maximum before saturation for peak height is 65 000.

Sequences and methods

➤ **Sequence :**

Program composed of different analysis methods that are selected: can be in a loop or not.

It permits to include calibration method (every day for example)

30' cycle permits to program : 4 calib + 20 ambient by day for example (1 day = 720')

Standard sequences are made for each amplification level

➤ **Méthod :**

Analysis program where all the parameters are recorded : temperature programm, relay activation, sampling time, acquisition time, thermodesorption time, associated substance table.

➤ **Our standard sequences and methods**

List of methods and sequences

Look at Quality Control report example

➤ **Time graph (example 15')**

